

CLAIMS

1. A medical grade deformer, comprising:
an axial member; and
5 a pliable tube mounted on said axial member and adapted to be deformed from a first, narrower diameter, configuration to a second, greater diameter, configuration.
2. A deformer according to claim 1, wherein said tube is slotted through its thickness.
- 10 3. A deformer according to claim 1, wherein said tube is not slotted.
4. A deformer according to claim 1, comprising at least one end engaging one end of said tube and adapted to apply compressive force to said tube for achieving said deformation.
- 15 5. A deformer according to claim 4, comprising at least a second end one end engaging a second end of said tube and adapted to cooperate with said first end to compress said tube.
6. A deformer according to claim 5, wherein said two engaging ends and said axial member lock to maintain said pliable tube in a greater diameter configuration.
- 20 7. A deformer according to claim 1, wherein said tube changes configuration by axial compression thereof.
8. A deformer according to claim 1, wherein said axial member is rigid.
- 25 9. A deformer according to claim 1, wherein said axial member is flexible.
10. A deformer according to claim 1, wherein said axial member extends out of said tube and is attached to a handle.
- 30 11. A deformer according to claim 1, wherein said axial member comprises a release mechanism for release of said deformer from a delivery system.

12. A deformer according to claim 11, wherein said axial member comprises a locking mechanism for locking of said deformer in a greater diameter configuration in conjunction with release.
- 5 13. A deformer according to claim 1, wherein said deformer includes a channel adapted for bone filler flow.
14. A deformer according to claim 13, wherein said channel is formed in said axial member.
- 10 15. A deformer according to claim 13, wherein said channel is formed between said axial member and said tube.
16. A deformer according to claim 1, wherein said axial member extends from said tube and is adapted to function as a hinge of a joint.
- 15 17. A deformer according to claim 1, wherein said deformer forms a bone attachment unit for a prosthesis.
- 20 18. A deformer according to claim 1, comprising an enclosing bag, which surrounds said tube in said second configuration.
19. A deformer according to claim 18, wherein said bag is bio-degradable in the body.
- 25 20. A deformer according to claim 18, wherein said bag is porous.
21. A deformer according to claim 1, wherein said deformer defines a general volume in the shape of a cylinder when in said second configuration.
- 30 22. A deformer according to claim 1, wherein said deformer defines a general volume in the shape of a truncated pyramid when in said second configuration.

23. A deformer according to claim 1, wherein said deformer defines an axially rotationally asymmetric general volume when in said second configuration.
24. A deformer according to claim 1, wherein said deformer defines a predetermined
5 general volume when in said second configuration.
25. A deformer according to claim 1, wherein said deformer comprises a set of axially contiguous zones with different material properties.
- 10 26. A deformer according to claim 1, wherein said deformer has a non-smooth outer surface in said second configuration.
27. A deformer according to claim 1, wherein said deformer is stiff enough, when in said second configuration to resist a trans-axial force of at least 50Kg.
- 15 28. A deformer according to claim 1, wherein said deformer, when in said second configuration has an axial applied force of at least 2Kg.
29. A deformer according to claim 1, wherein said pliable material has a shore hardness of
20 between 50A and 90D.
30. A deformer according to claim 1, wherein said pliable material is non-metallic.
31. A deformer according to claim 1, wherein said pliable material is polymeric.
- 25 32. A deformer according to claim 1, wherein said deformer includes at least one axial thread.
33. A deformer according to claim 1, wherein said deformer includes at least one
30 circumferential thread.
34. A deformer according to claim 1, wherein said deformer, in said second configuration, defines a general volume and wherein said deformer fills at least 30% of said volume.

35. A deformer according to claim 1, wherein said deformer, in said second configuration, defines a general volume and wherein said deformer fills at least 50% of said volume.
- 5 36. A deformer according to claim 1, wherein said tube defines a plurality of slots, such that when deformed to the second configuration, a plurality of axially displaced leaves extend from said tube to define said second configuration.
37. A deformer according to claim 36, wherein said tube defines at least three axially
10 displaced leaves.
38. A deformer according to claim 36, wherein adjacent leaves support each other, in said second configurations.
- 15 39. A deformer according to claim 36, wherein an end leaf is shorter than a non-end leaf.
40. A deformer according to claim 36, wherein an end leaf is supported, on one side thereof, by an end cap of said deformer.
- 20 41. A deformer according to claim 36, wherein adjacent leaves deform each other.
42. A deformer according to claim 36, wherein at least 50% of the leaves are deformed from a plane.
- 25 43. A deformer, comprising a non-inflatable substantially non-absorbent deformable non-metallic body having two configurations, a first configuration in which said body has a narrower diameter and a second configuration in which said narrower diameter is greater, wherein said deformer is adapted to remain substantially undeformed under a force of over 10 Kg and wherein said deformer is sized for positioning inside a human vertebra.
- 30 44. A deformer according to claim 43, wherein said deformer is adapted to remain substantially undeformed when in a human lumbar vertebra in standing condition.

45. A deformer according to claim 43, wherein said deformer is self-expanding.
46. A deformer according to claim 43, as part of kit including a spinal access tool.
- 5 47. A method of spinal surgery, comprising:
inserting a non-inflatable non-absorbent deformable deformer into a vertebra; and
deforming said deformer such that cortical bone of vertebral faces of said vertebra,
move relative to each other.
- 10 48. A method of treating a bone, comprising:
inserting a unsealed pliable element into the bone; and
mechanically deforming the pliable element such that said pliable element applies
deforming force on the bone.
- 15 49. A method according to claim 48, wherein said pliable element comprises at least one
open aperture of cross-section greater than 0.5x0.5 mm.
50. A method according to claim 48, wherein said bone comprises a vertebral bone.
- 20 51. A method according to claim 48, wherein said bone comprises a long bone.
52. A method of achieving a desired bone displacement, comprising:
determining a desired degree of displacement;
determining a deformation amount, of a deformer, suitable to achieve said deformation;
25 inserting a suitable deformer into a bone; and
deforming said deformer, said deformation amount, to achieve said displacement to
within 2 mm.
53. A method of deforming a medical deformer, comprising:
30 (a) applying a compressing force;
(b) retracting an overtube;
(c) repeating (a) and (b) such that a plurality of sections of the deformer deform to a
greater diameter; and

(d) applying a final compressing force to stiffen the deformer.

54. A method according to claim 53, wherein said repeating is intermittent.

5 55. An inflatable bone moving element, comprising:
(a) a first balloon;
(b) a second enclosing balloon; and
(c) a dual balloon inflator adapted to first inflate the inner balloon and then inflate the
outer balloon, such that the inner balloon constrain the direction of expansion of the outer
10 balloon.

56. A deformer delivery system, comprising:
a distal end adapted to be inserted into a vertebra through a cannula;
a proximal body including a handle; and
15 a spacer adapted to vary in length and maintain a distance between said body and said
cannula, thereby maintaining a relative position of said distal end and said vertebra.

57. A system according to claim 56, wherein said spacer is integral to said system.

20 58. A deformer delivery system, comprising:
(a) an over tube;
(b) an over tube retractor;
(c) a pushing element adapted to deform a deformer; and
(d) a synchronizing mechanism adapted to retract said overtube in synchrony with
25 advancing said pushing element, wherein said retractor delays until after said pushing element
starts deforming said deformer a given amount.

59. A deformer delivery system, comprising:
(a) an over tube;
30 (b) an over tube retractor;
(c) a pushing element adapted to deform a deformer; and

(d) a synchronizing mechanism adapted to retract said overtube in synchrony with advancing said pushing element, wherein said retractor is adapted to retract said overtube also when said pushing element is retracted.

- 5 60. A deformer delivery system, comprising:
- (a) an over tube;
 - (b) an over tube retractor;
 - (c) a pushing element adapted to deform a deformer; and
 - (d) a synchronizing mechanism adapted to retract said overtube in synchrony with
- 10 advancing said pushing element, wherein said delivery system has an axial extent shorter than 130% of an extent of motion of said pushing element.

61. A deformer delivery system according to claim 60, wherein said axial extent is less than 100% of said extent of motion.